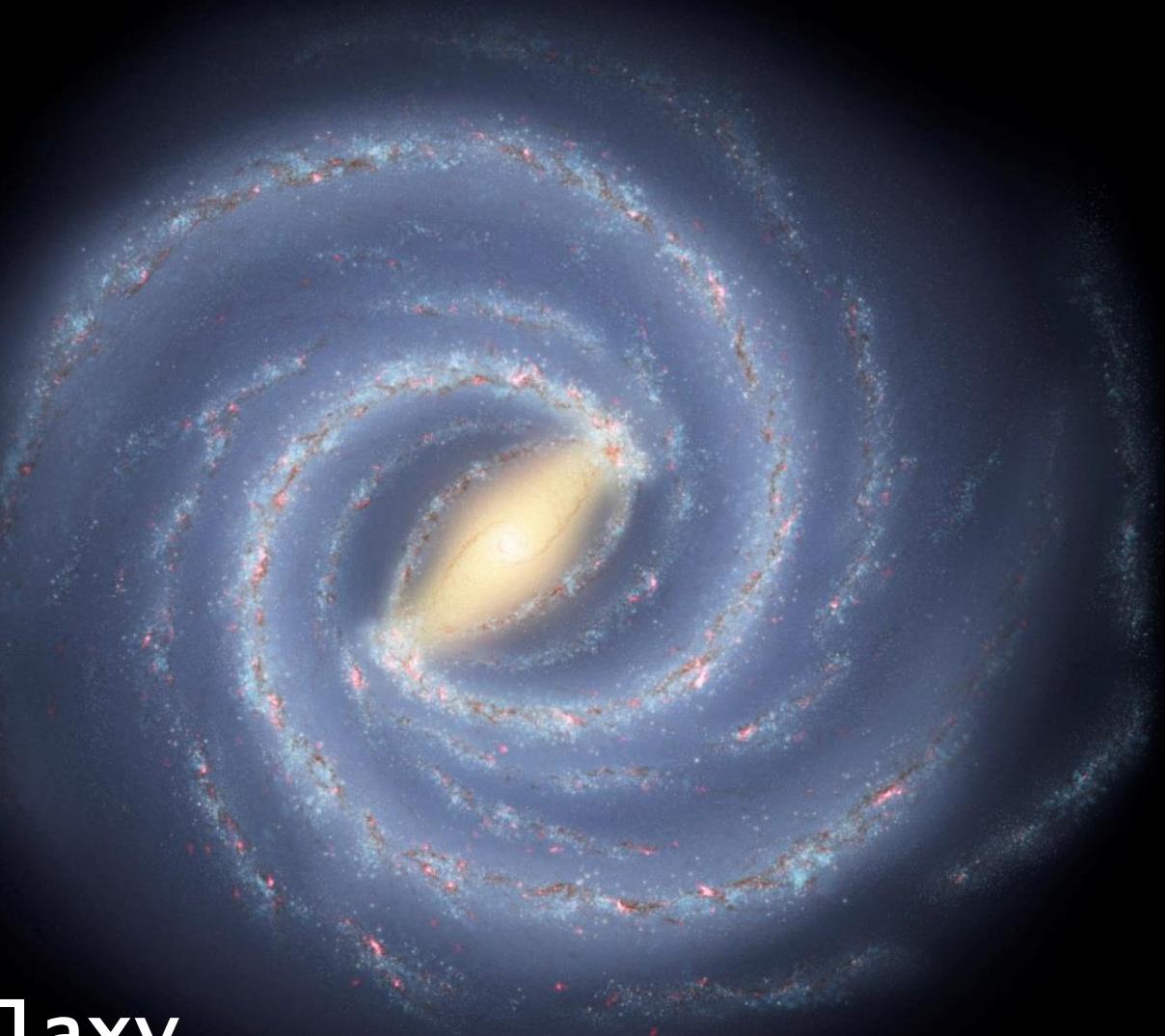


Hubble's Views of the Deep Universe

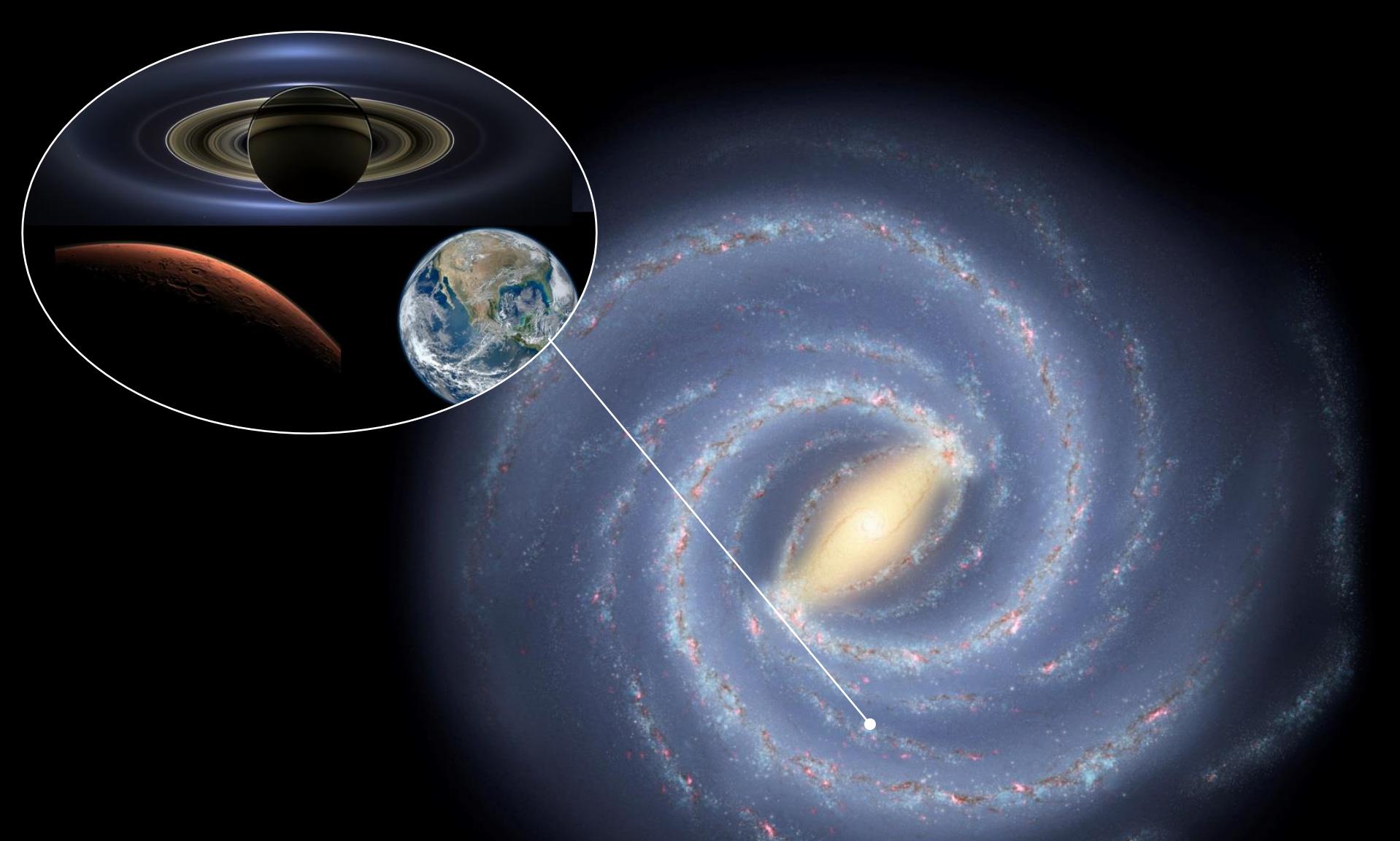


Dr. Brandon Lawton
Space Telescope
Science Institute

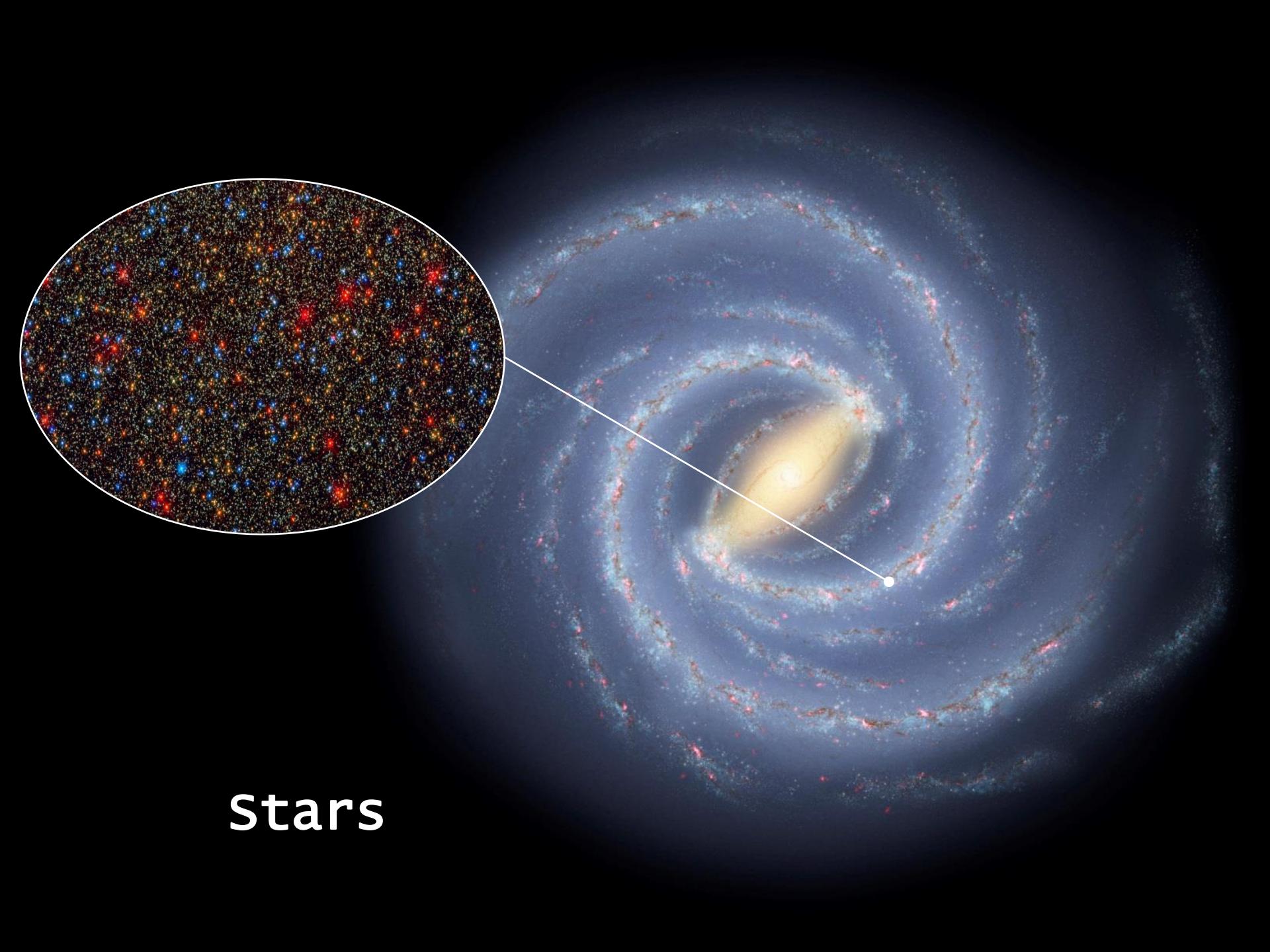




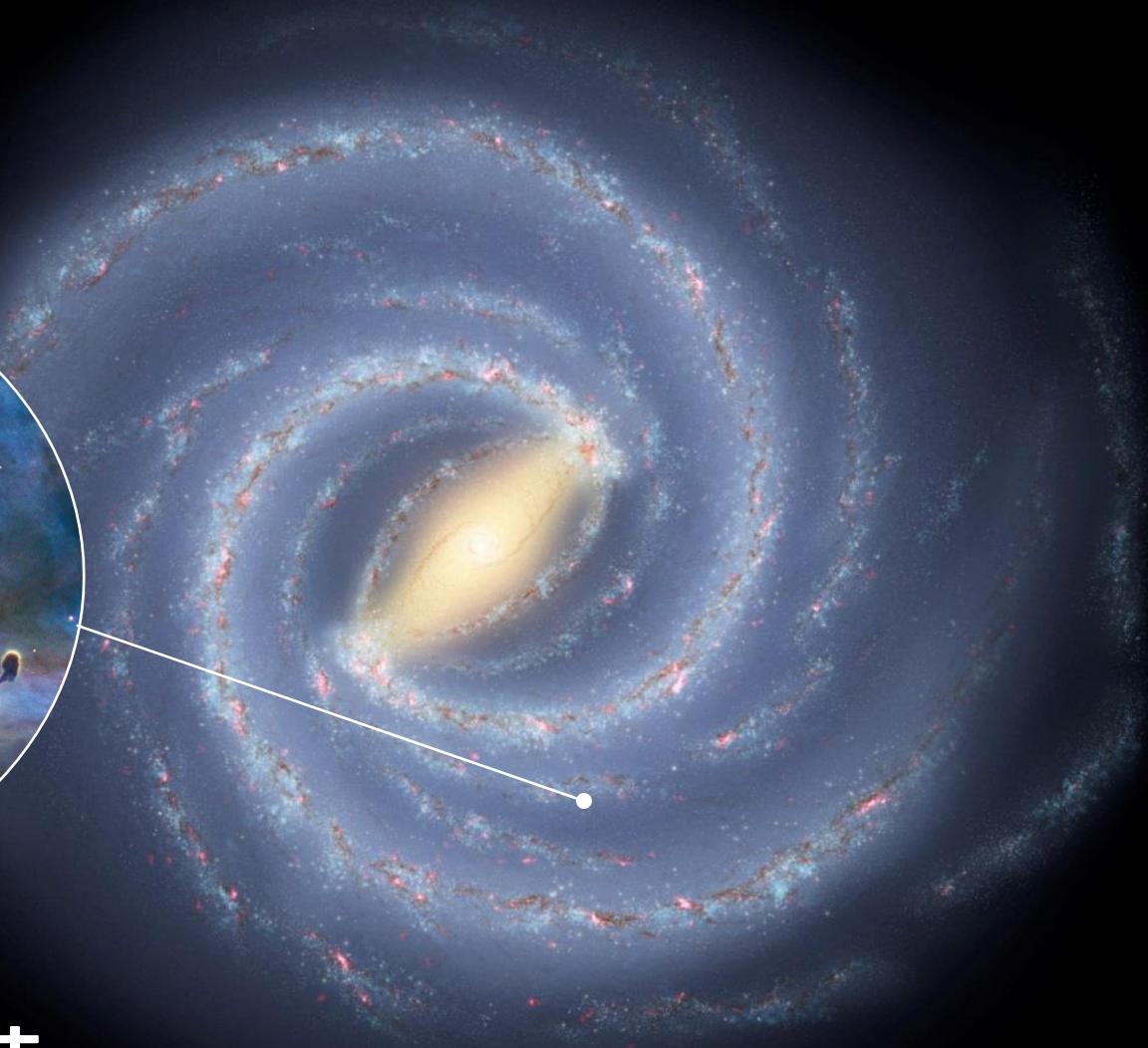
Milky Way Galaxy



Planets and Moons



Stars



Gas and Dust





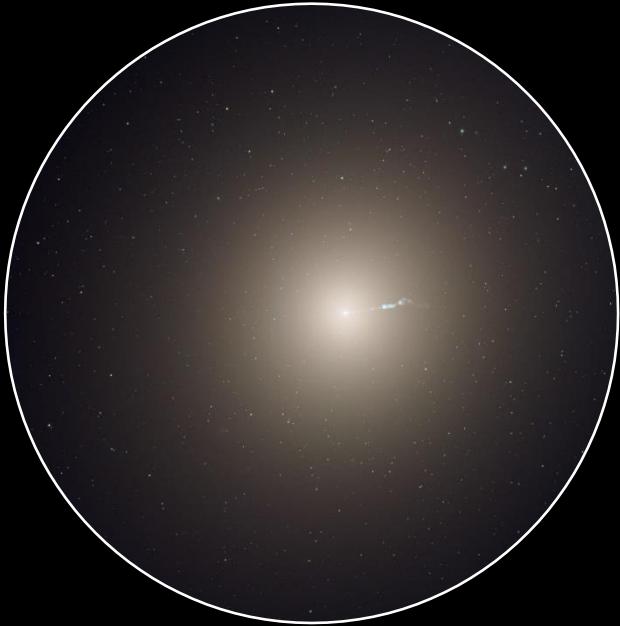




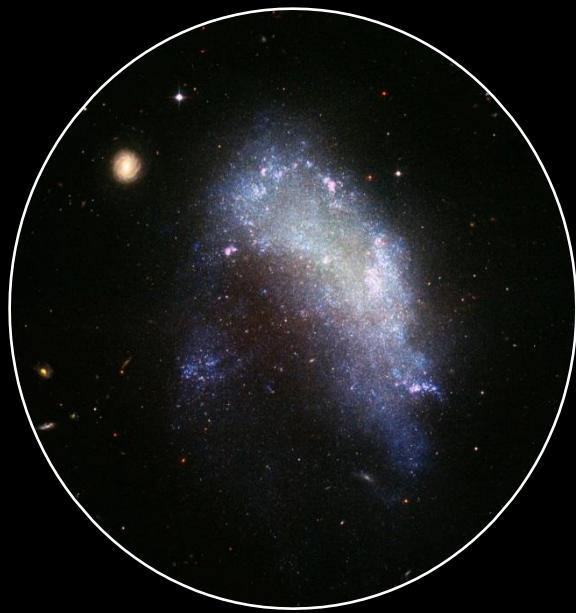




Spiral



Elliptical



Irregular

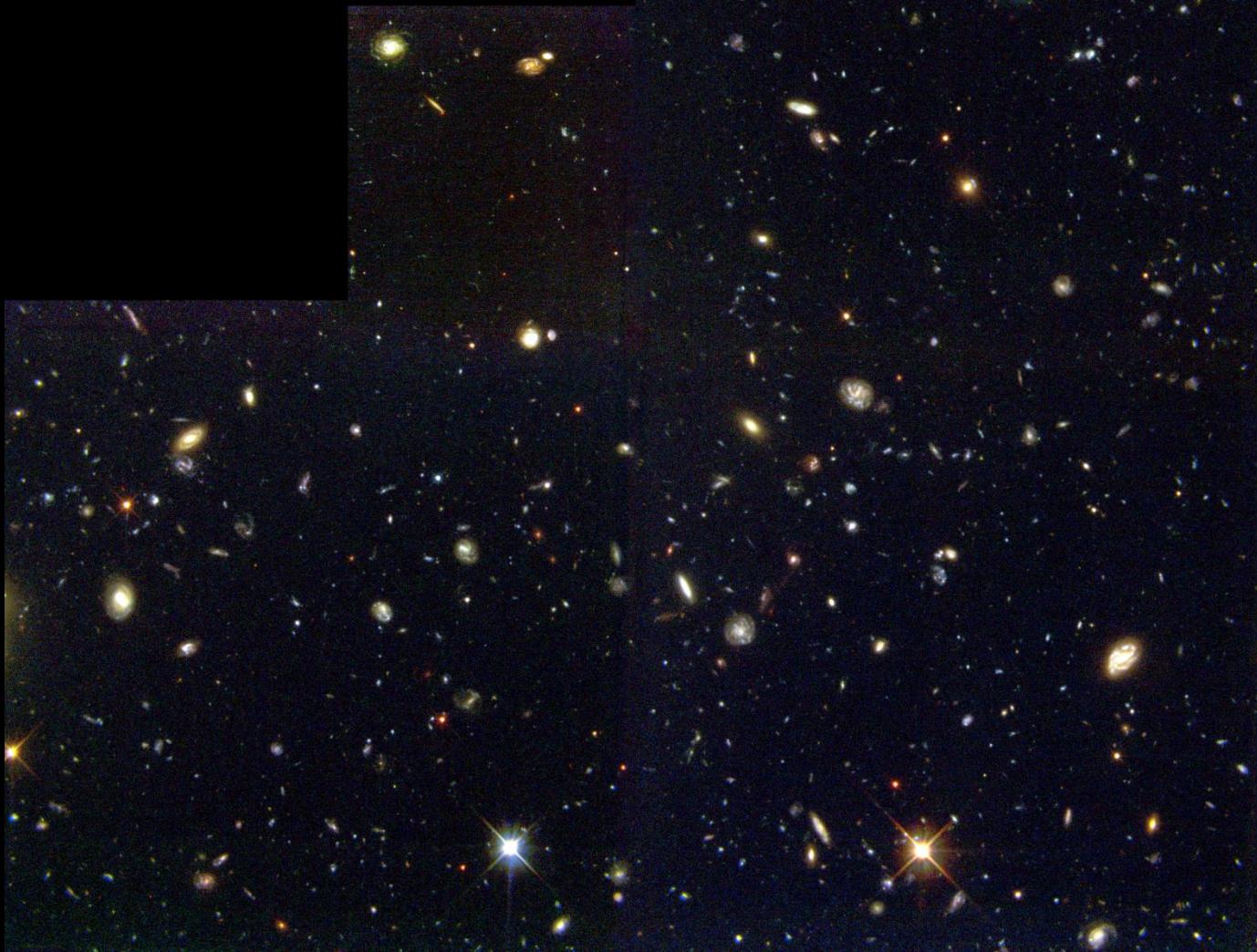
Hubble Deep Field



Dr. Robert
Williams

1996

Hubble Deep Field-South



Dr. Robert
Williams

1998

A deep space photograph showing a dense field of galaxies of various sizes, shapes, and colors against a dark background.

Hubble ultra Deep Field

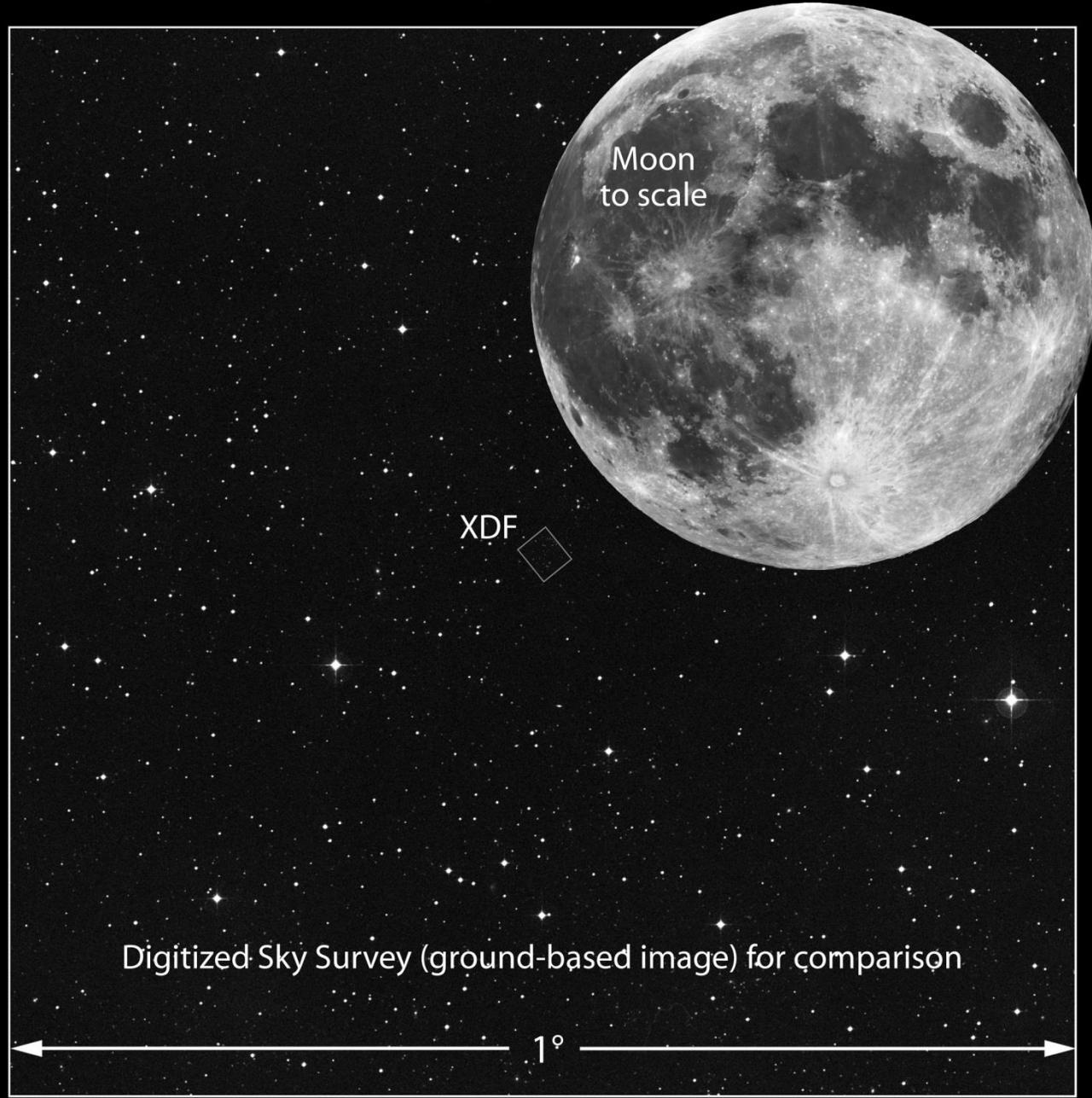


Dr. Steven
Beckwith

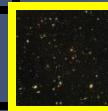
2004

Size of Hubble eXtreme Deep Field on the Sky

Angular Size Comparisons

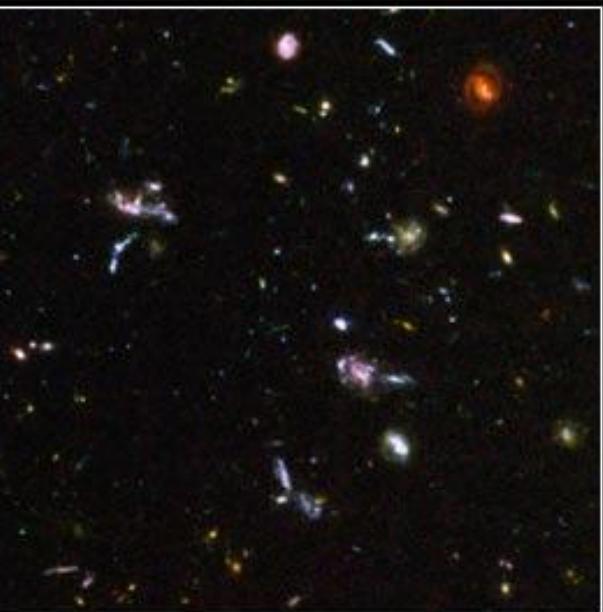
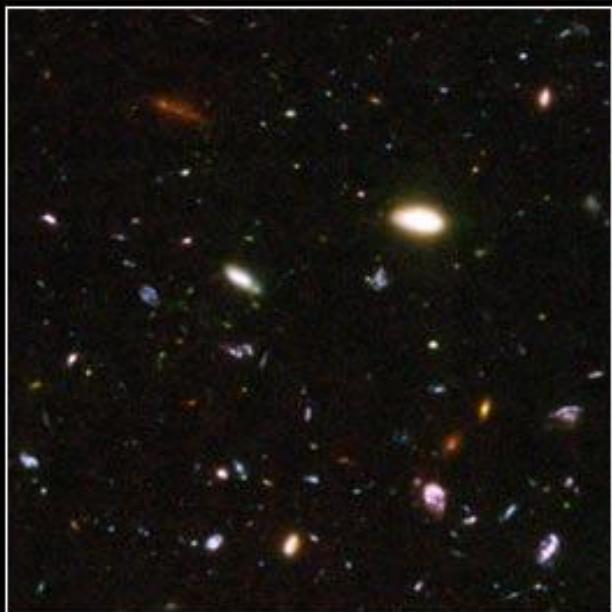
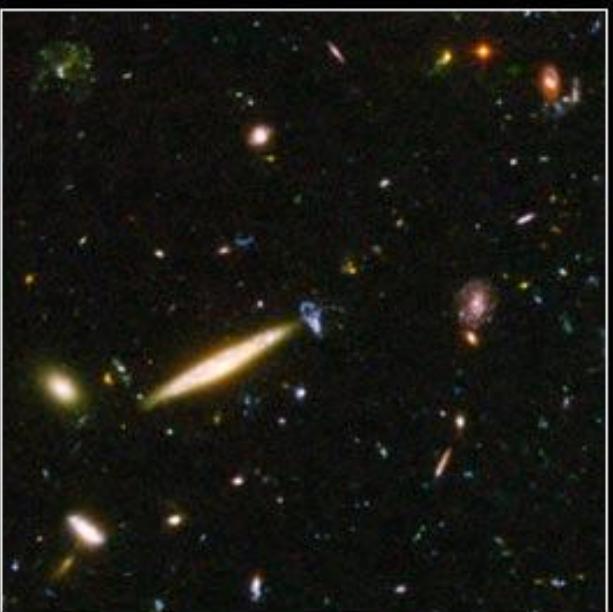
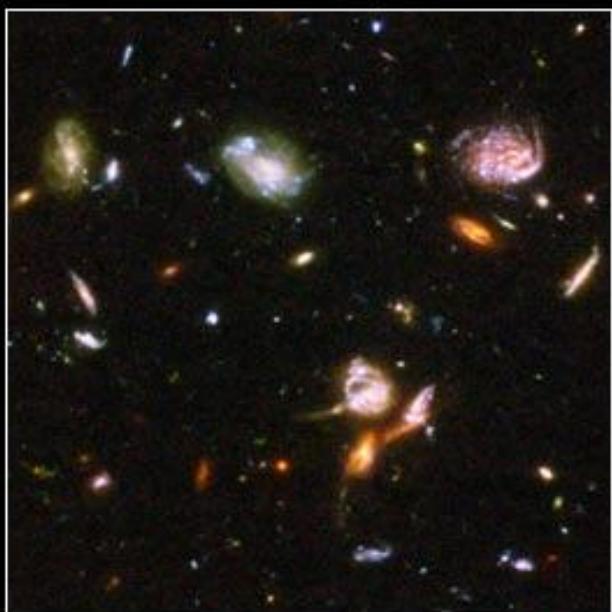


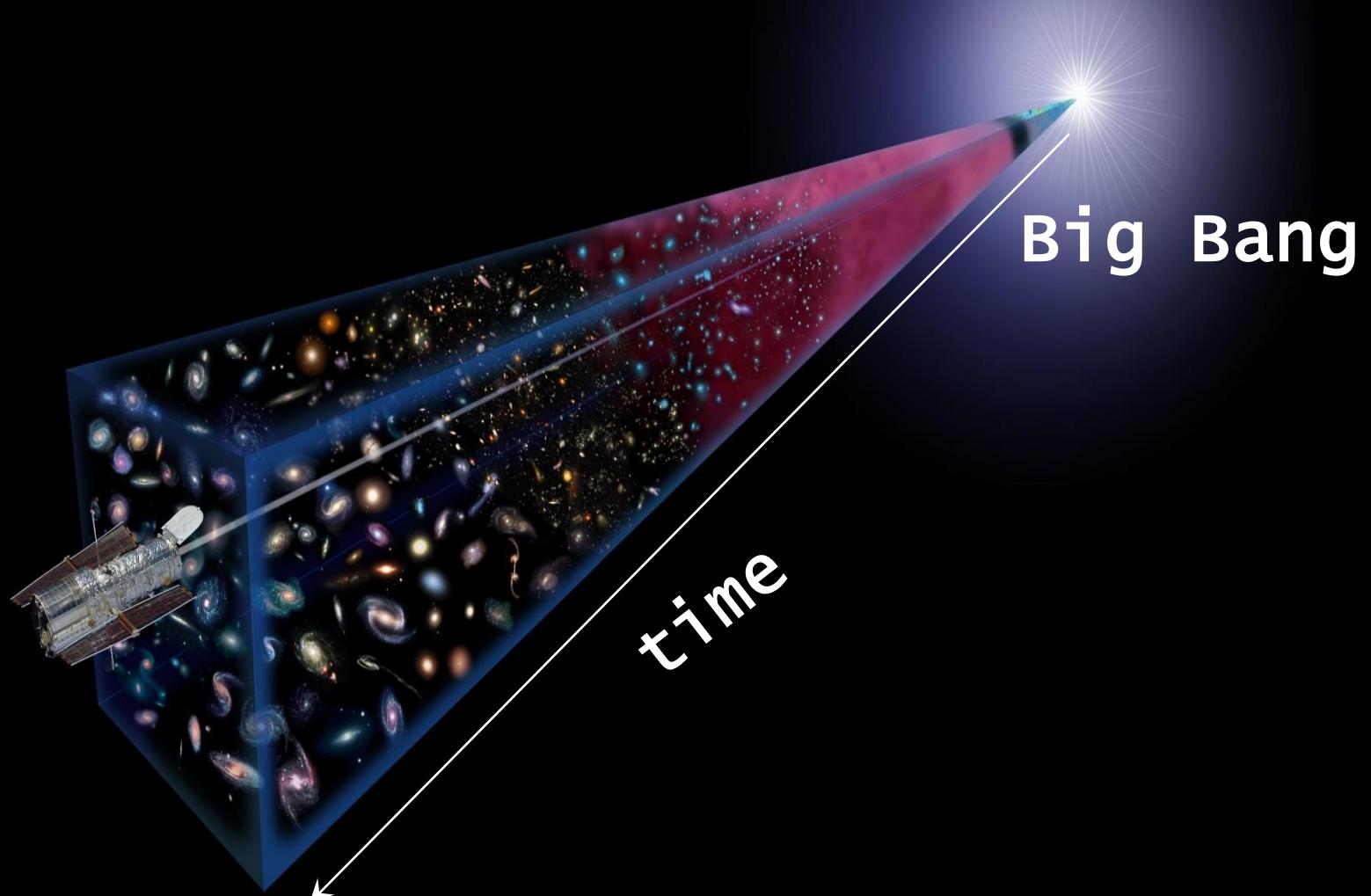
Across the entire sky, there are 12,746,784 patches the same size as the HUDF



Hubble Ultra Deep Field Details

HST • ACS



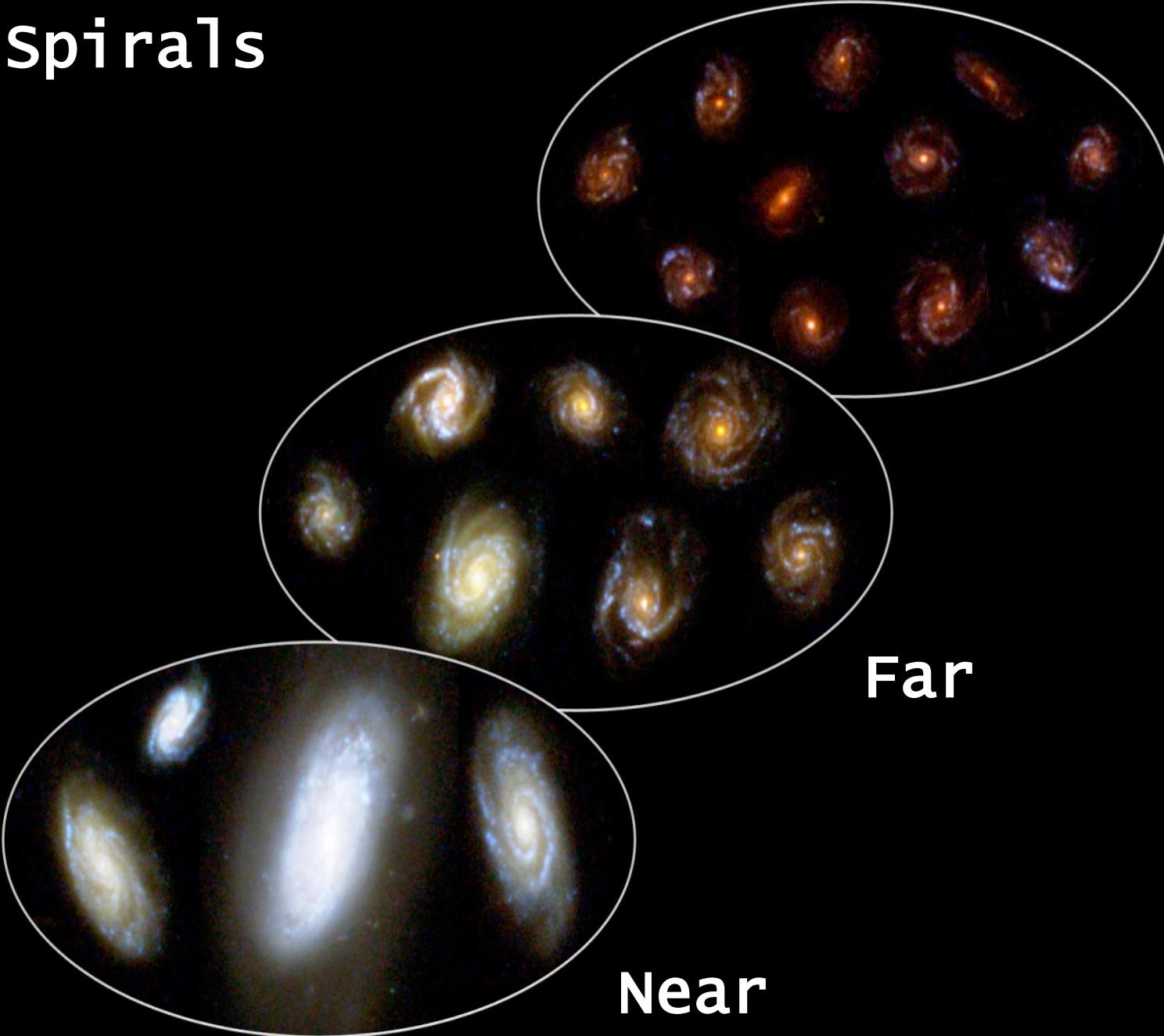


Present

Big Bang

time

Spirals



Very
Far

Far

Near

A deep space photograph from the Hubble Space Telescope's Ultra Deep Field survey. The image is filled with a vast number of galaxies of various sizes, shapes, and colors, ranging from small, faint blue points to large, bright yellow and orange spirals. The distribution of galaxies shows a clear hierarchical structure, with more galaxies appearing in the foreground and fewer in the background.

Hubble Ultra Deep Field

2004

A wide-field image of the Hubble Ultra Deep Field, showing a dense cluster of galaxies of various sizes and colors against a dark background.

Hubble
Ultra
Deep
Field

2004

Hubble ultra Deep Field



Dr. Garth
Illingworth

2009



Hubble ultra Deep Field



Dr. Richard
Ellis

2012



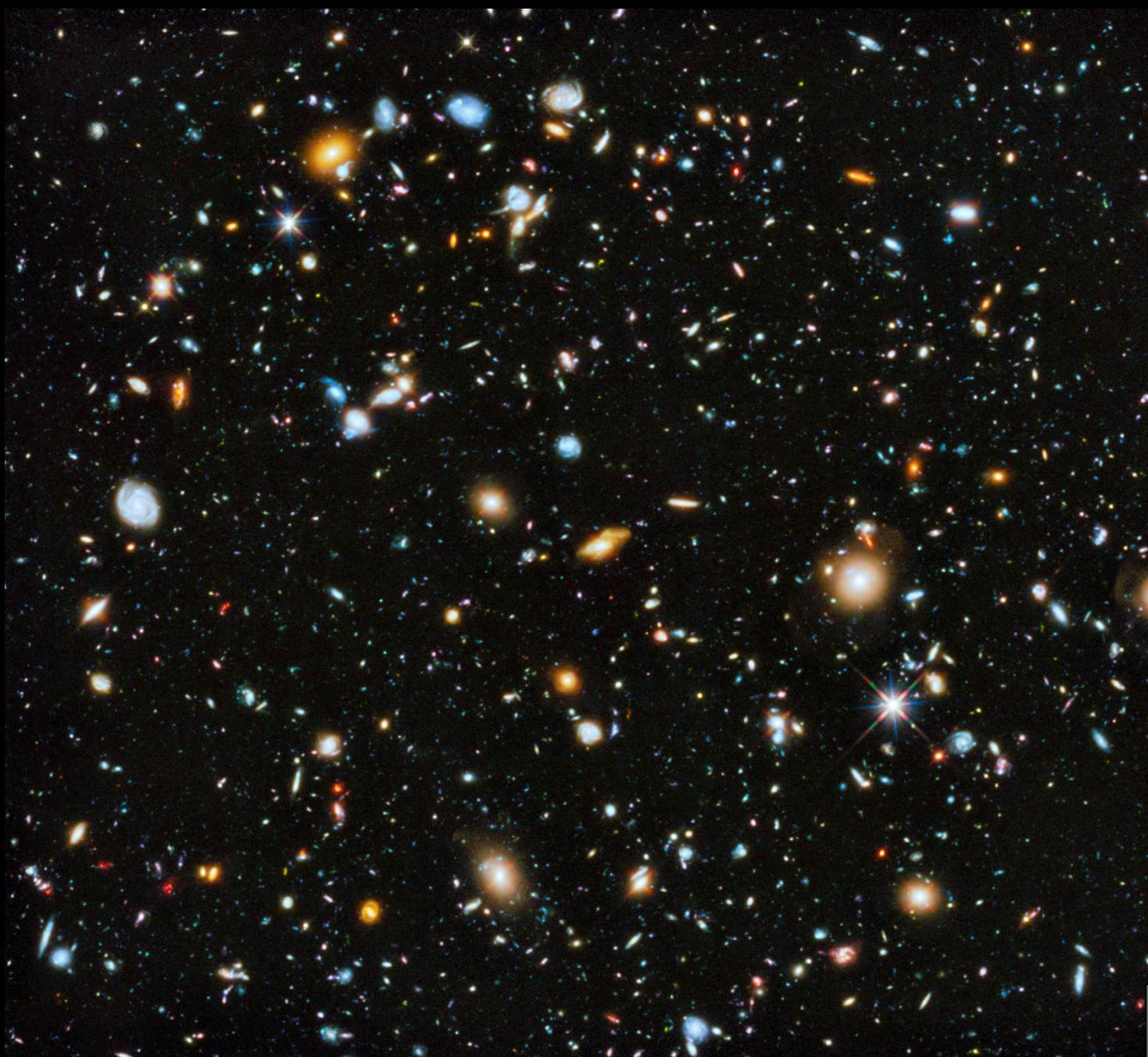
extreme Deep Field



Dr. Garth
Illingworth

2012

Hubble ultra Deep Field



Dr. Harry
Teplitz

2014

Hubble ultra Deep Field



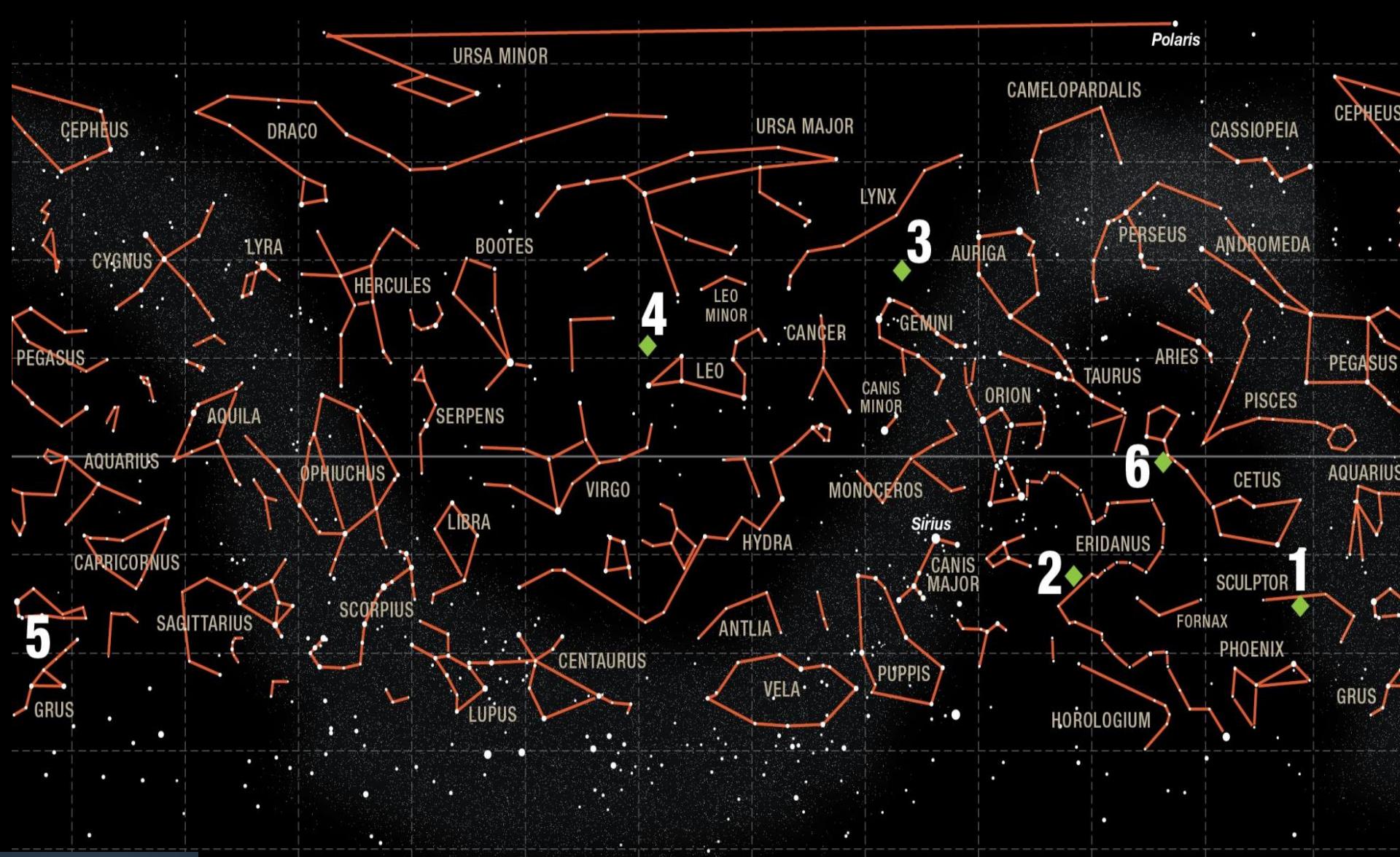
2014

Hubble Frontier Fields



Dr. Jennifer
Lotz

2013-2016



1



2



3



4



5



6



1

FRONTIER
FIELDS



2014

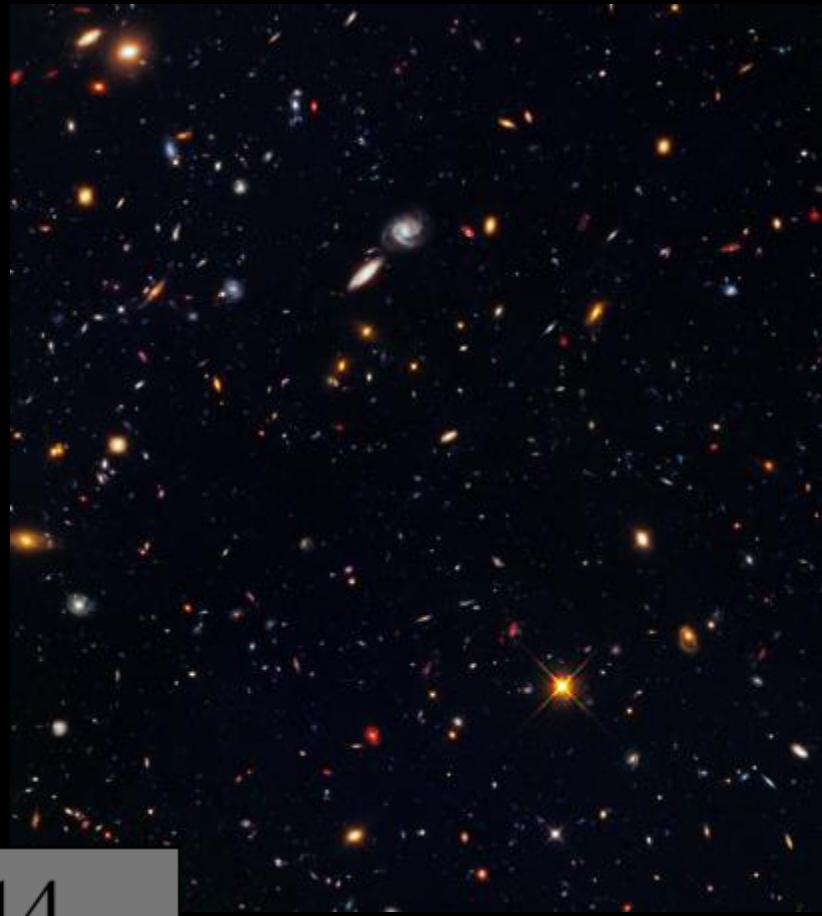
Abell 2744

2

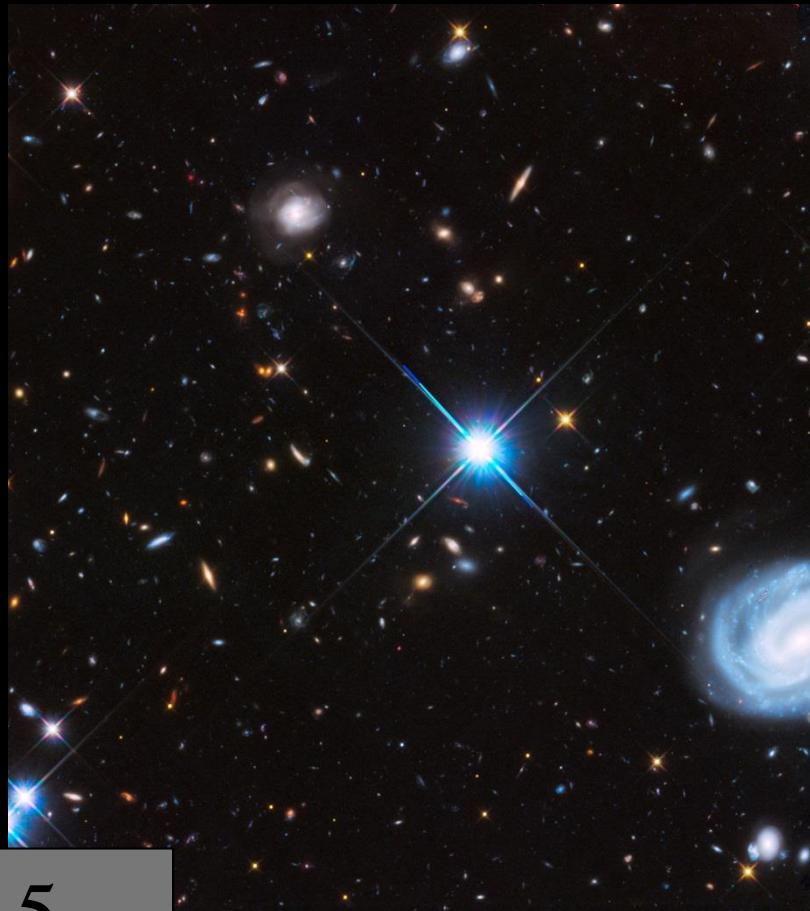
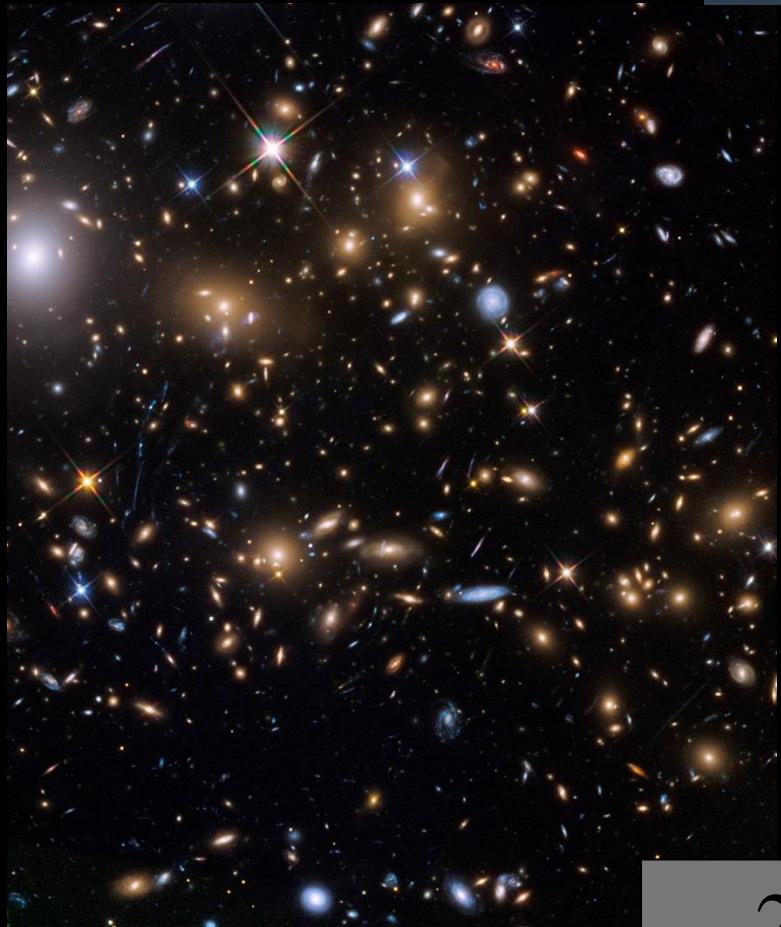


2014

MACS J0416



3



2015

MACS J0717



2014

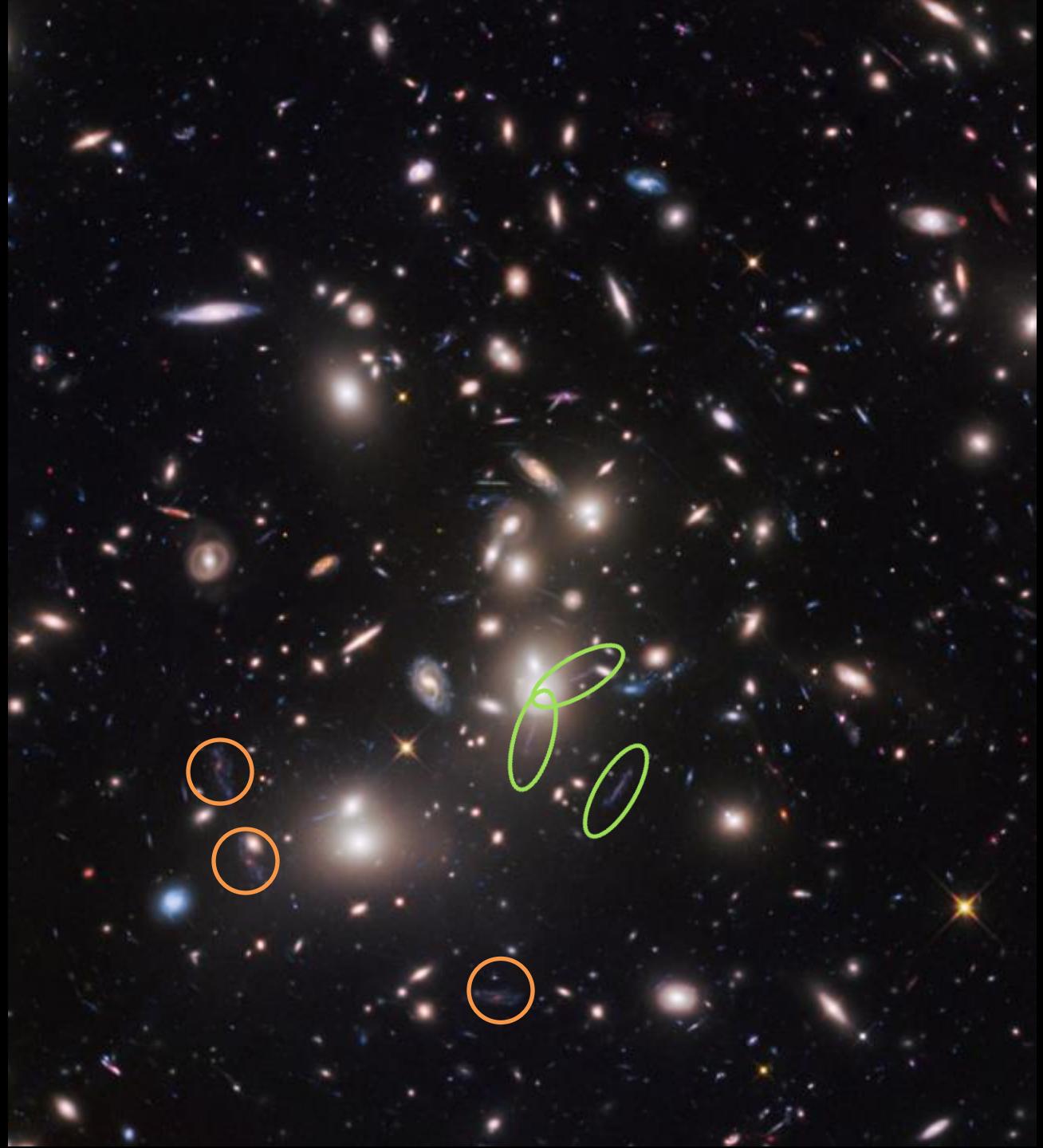
Abell 2744
Galaxy
cluster

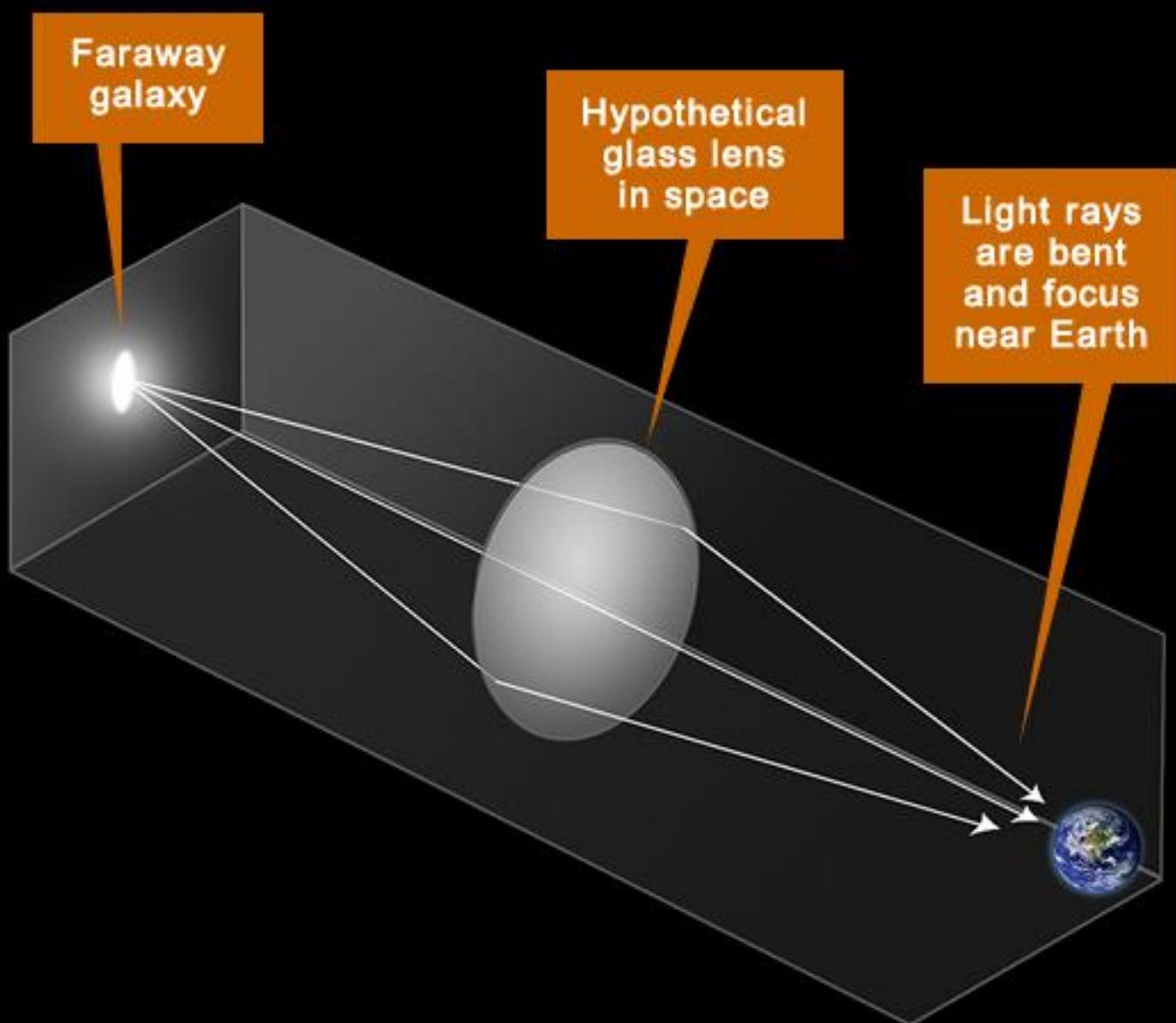


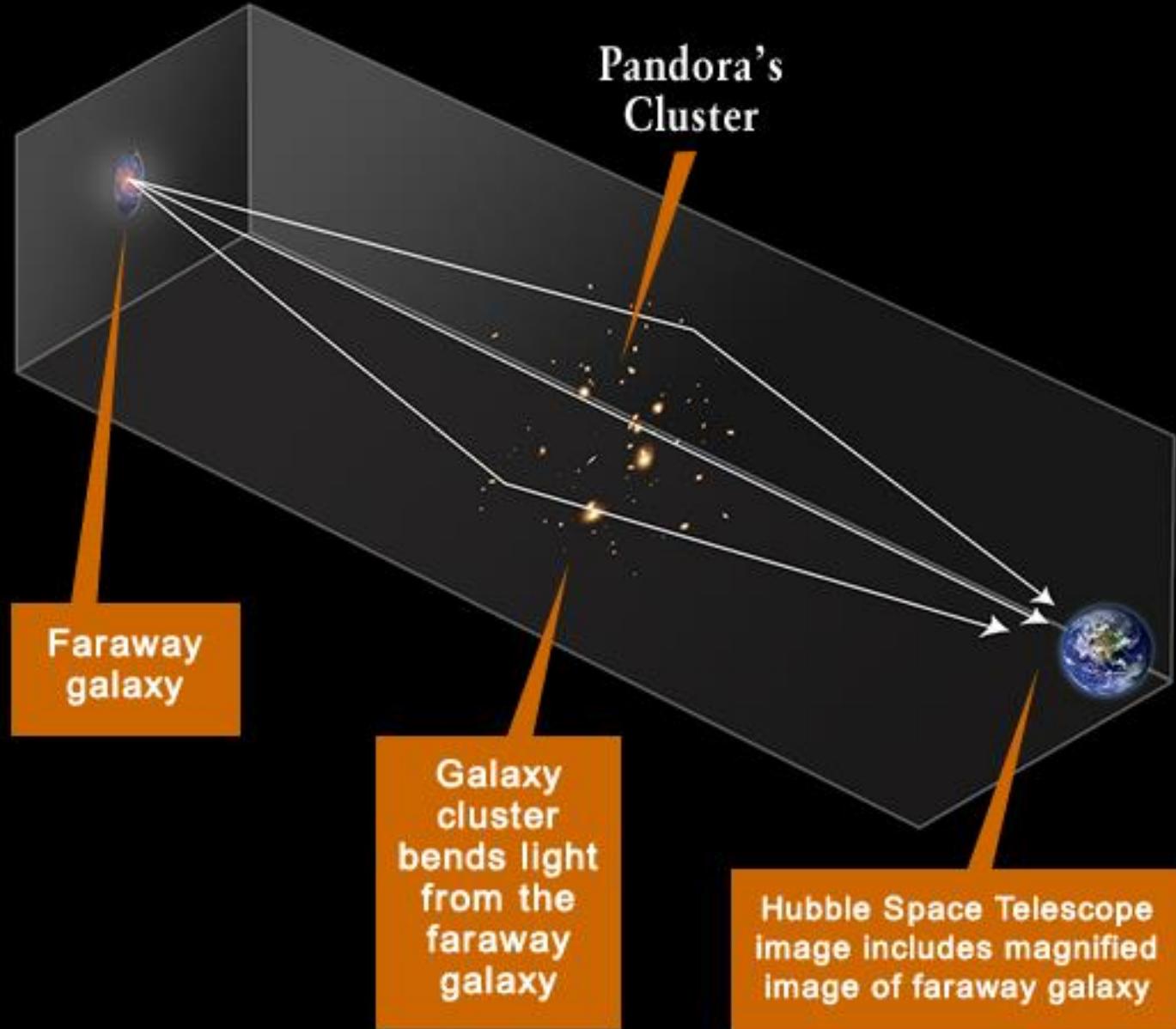


2014

Abell 2744
Galaxy
cluster



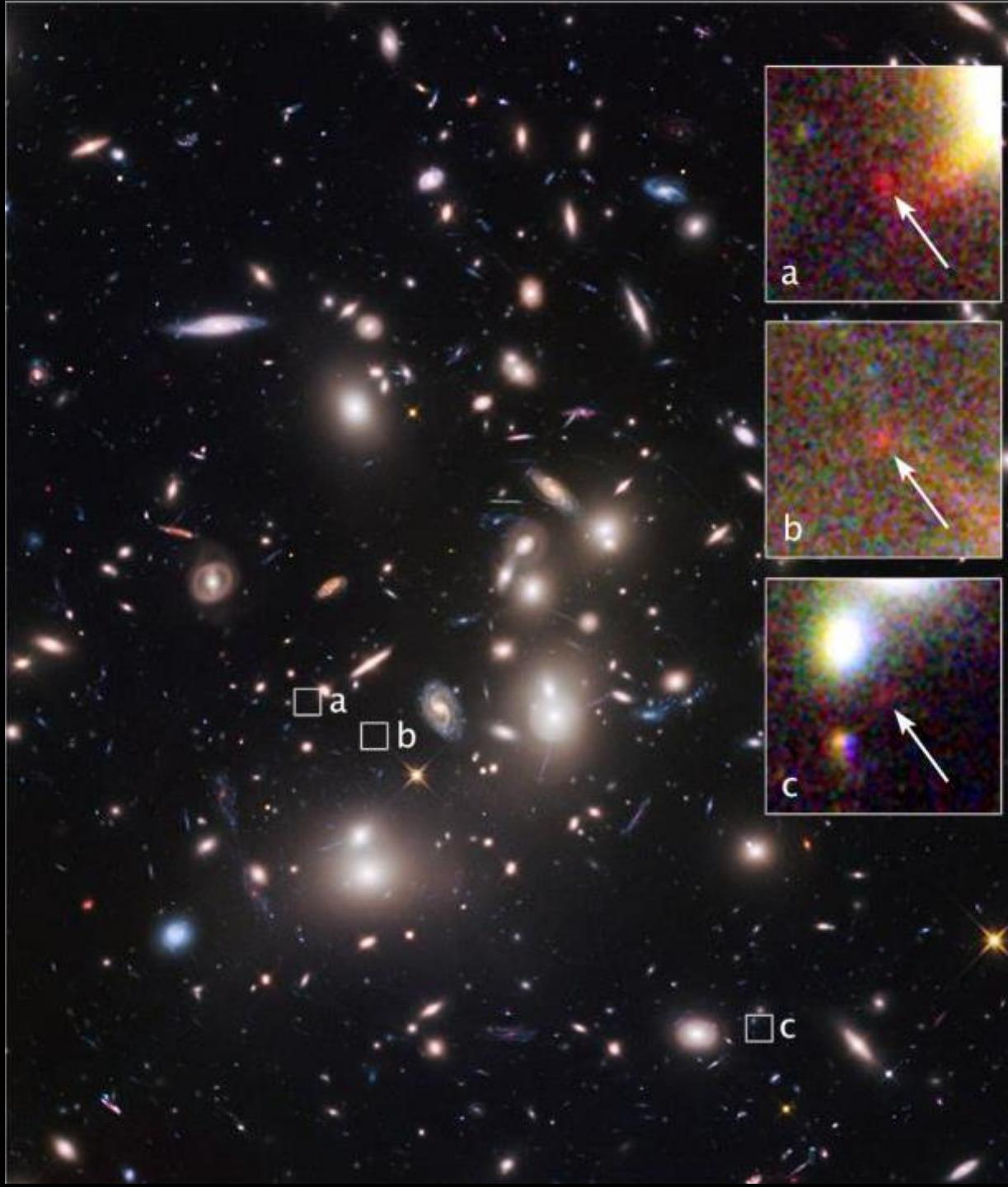






2014

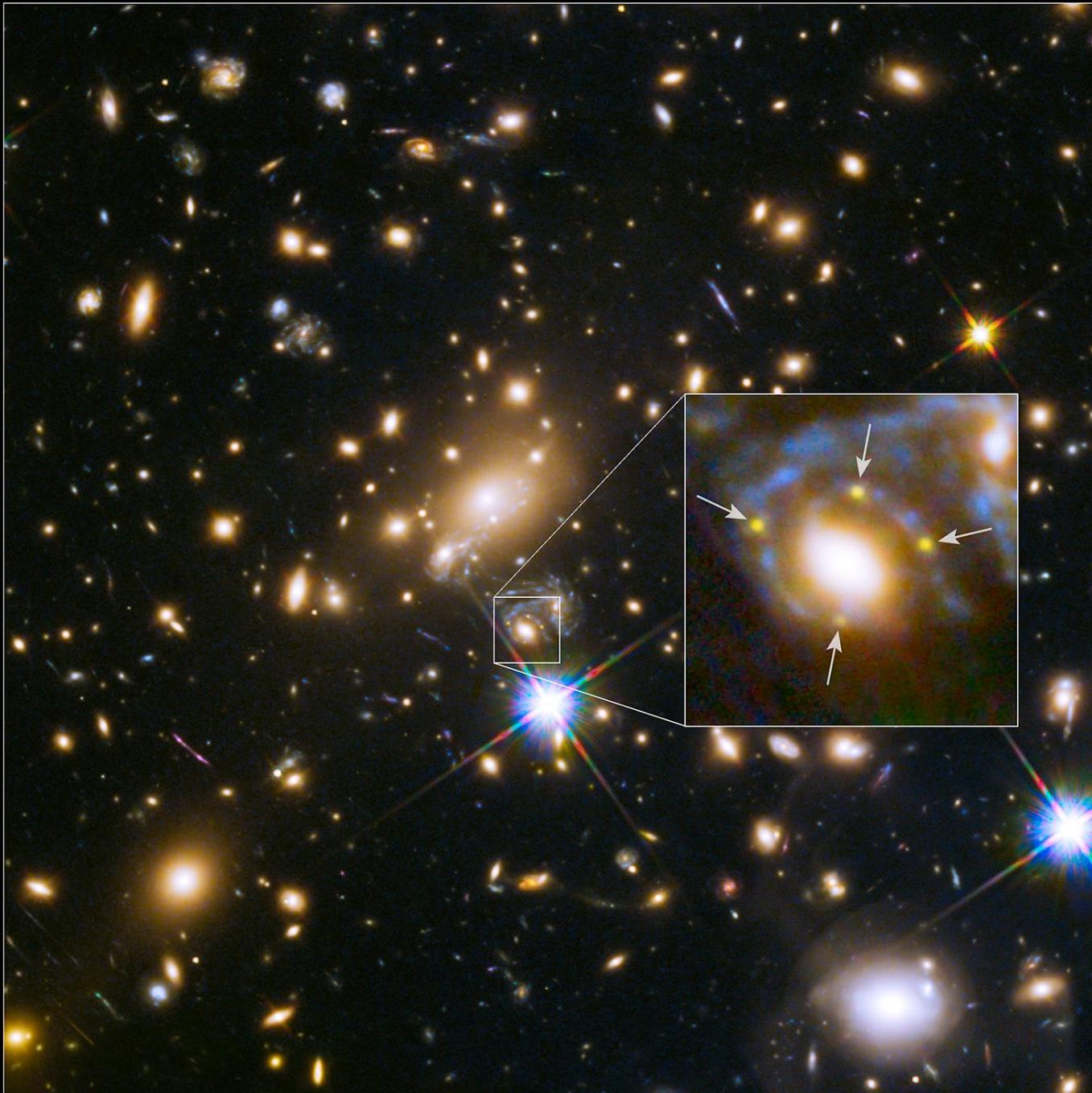
Abell 2744 Galaxy cluster





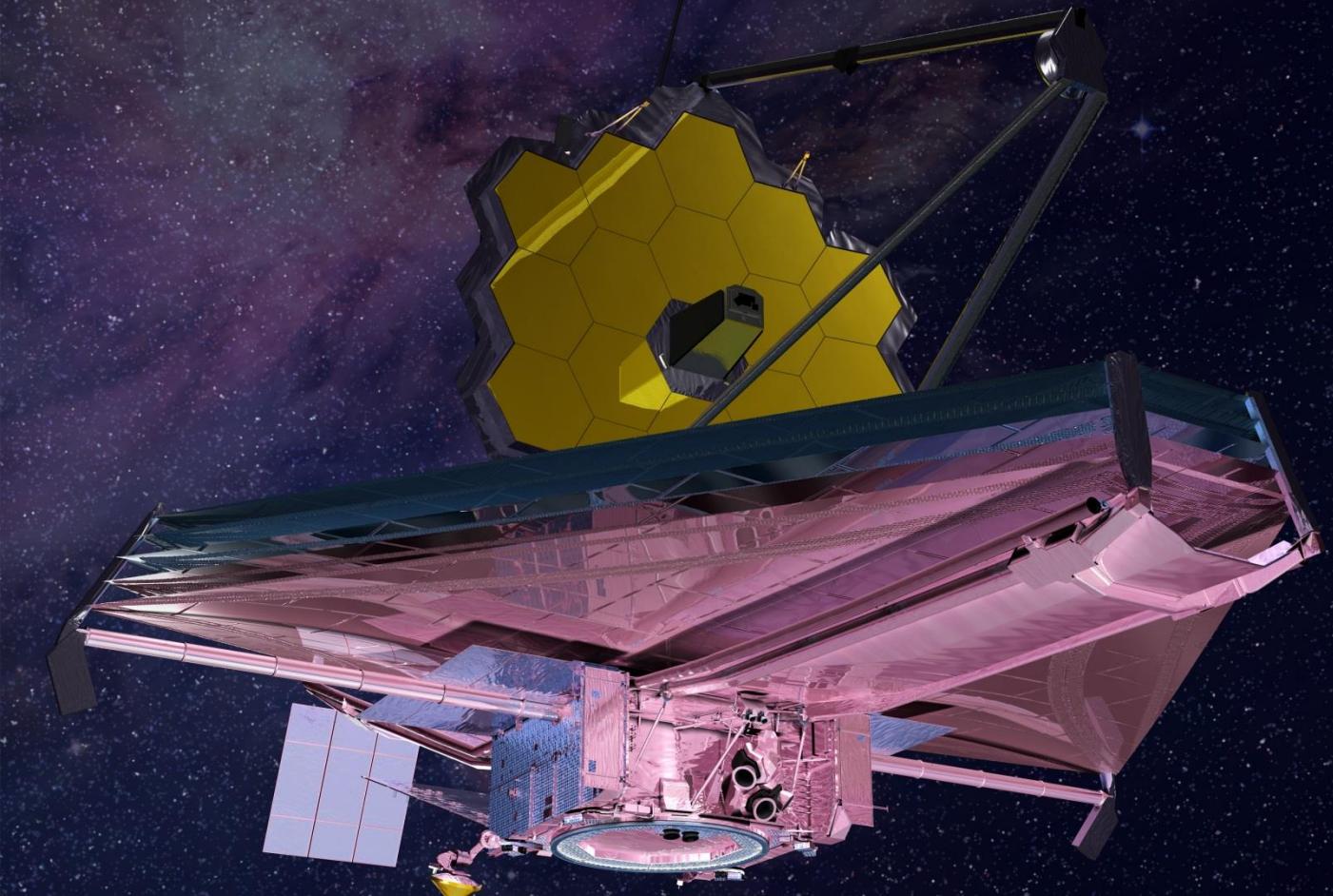
2015

MACS J1149 Galaxy Cluster





James Webb Space Telescope (JWST)





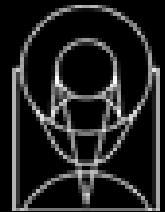


Image Credits:

HST: NASA

Milky Way Galaxy: NASA/JPL-Caltech/R. Hurt (ssc/caltech)

Saturn: NASA/JPL-Caltech/SSI

Mars: NASA/JPL-Caltech

Earth: NASA

Omega-Cen: NASA, ESA, and the Hubble SM4 ERO Team

Carina Nebula: NASA, ESA, and M. Livio and the Hubble 20th Anniversary Team (STScI)

Girl: Alvesgaspar/CC-BY-SA-2.5

Vancouver Crowd: vaska037/CC-BY-2.0

China crowd: Steve Jurvetson/CC-BY-2.0

M101: Hubble Image - NASA, ESA, K. Kuntz (JHU), F. Bresolin (University of Hawaii), J. Trauger (JPL), J. Mould (NOAO), Y. -H. Chu (University of Illinois, Urbana), and STScI: CFHT Image - Canada-France-Hawaii Telescope/J. -C. Cuillandre/Coelum; NOAO Image - G. Jacoby, B. Bohannan, M. Hanna/NOAO/AURA/NSF

M87: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

NGC 1427A: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)
Hubble Deep Field: Robert Williams, and the Hubble Deep Field Team (STScI) and NASA

Hubble Deep Field-South: Robert Williams, the HDF-S Team, and NASA
Hubble ultra Deep Field 2004: NASA, ESA, S. Beckwith (STScI) and the HUDF Team

XDF Scale: T. Rector, I. Dell'Antonio/NOAO/AURA/NSF, Digitized Sky Survey (DSS), STScI/AURA, Palomar/Caltech, and UKSTU/AAO
HUDF 2004 Galaxies: NASA, ESA, S. Beckwith (STScI) and the HUDF Team

Hubble Look-back: Ann Feild/STScI

GOODS Galaxies: NASA, ESA, F. Summers, and Z. Levay (STScI)

Hubble Ultra Deep Field 2009: NASA, ESA, G. Illingworth, (UCO/Lick Observatory and the University of California, Santa Cruz), R. Bouwens (UCO/Lick Observatory and Leiden University), and the HUDF09 Team

Hubble ultra Deep Field 2012: NASA, ESA, R. Ellis (Caltech), and the HUDF12 Team

XDF: NASA, ESA, G. Illingworth, D. Magee, and P. Oesch (University of California, Santa Cruz), R. Bouwens (Leiden University), and the HUDF09 Team

Hubble Ultra Deep Field 2014: NASA, ESA, H. Teplitz and M. Rafelski (IPAC/Caltech), A. Koekemoer (STScI), R. Windhorst (Arizona State University), and Z. Levay (STScI)

Abell 2744 and parallel field: NASA, ESA, and J. Lotz, M. Mountain, A. Koekemoer, and the HFF Team (STScI)

FF Locations: STScI, J. Cornmell, and IAU

FF Postage Stamps: Digitized Sky Survey (STScI/NASA) and Z. Levay (STScI)

MACS J0416 and parallel field: NASA, ESA, and J. Lotz, M. Mountain, A. Koekemoer, and the HFF Team (STScI)

MACS J0717 and parallel field: NASA, ESA, and J. Lotz, M. Mountain, A. Koekemoer, and the HFF Team (STScI)

Gravitational Lensing Graphics: Ann Feild (STScI)

FF High-z Lensed Galaxy: NASA, ESA, A. Zitrin (California Institute of Technology), and J. Lotz, M. Mountain, A. Koekemoer, and the HFF Team (STScI)

FF Lensed Supernova: NASA, ESA, and S. Rodney (JHU) and the FrontierSN Team; T. Treu (UCLA), P. Kelly (UC Berkeley), and the GLASS Team; J. Lotz and the Frontier Fields Team; M. Postman (STScI) and the CLASH Team; and Z. Levay (STScI)

JWST Graphics: Northrop Grumman

Additional Resources:

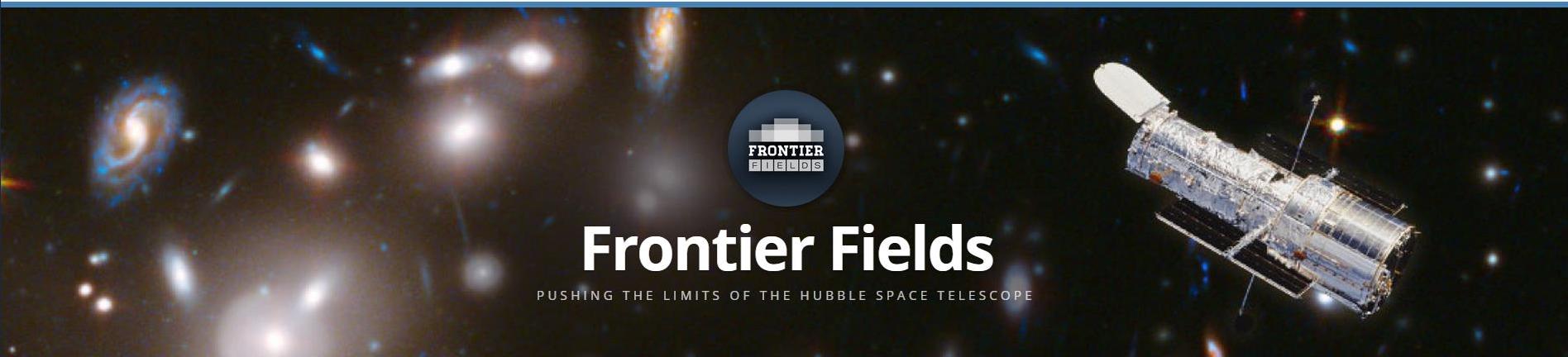


Return to find new features and events throughout the year.

Hubble25th.org



Additional Resources:



April 22, 2015 Dr. Brandon Lawton

Taking Stock During this Hubble Anniversary Week

This is a big week for the Hubble Space Telescope. Twenty-five years ago, on April 25, 1990, the Hubble Space Telescope was released into orbit from the Space Shuttle Discovery. Astronomers from around the world are taking stock of the amazing achievements of Hubble over the past 25 years: observations that continually challenge

Welcome to Frontier Fields

Frontier Fields draws on the power of massive clusters of galaxies to unleash the full potential of the Hubble Space Telescope. The gravity of these clusters warps and magnifies the faint light of the



frontierfields.org

Additional Resources:

The collage displays six 'Universe Discovery Guides' cards arranged in two columns of three. Each card features a title, a NASA logo, and a small image related to the topic. The titles are: 'RING NEBULA AND VEIL NEBULAE' (July), 'THE SEARCH FOR HABITABLE PLANETS' (August), 'MILKY WAY GALAXY: CITY OF STARS' (September), 'WHAT IS THE FATE OF THE UNIVERSE?' (October), 'ARE ALL PLANET FAMILIES LIKE OURS?' (November), and 'CRAB NEBULA' (December). Each card also includes a 'IN THIS GUIDE' section with links to 'EDUCATOR RESOURCES', 'SKY FEATURE', 'TRY THIS!', 'ACTIVITY SHEET OR TEST', and 'CONNECT TO NASA SCIENCE'.

UNIVERSE DISCOVERY GUIDES

May

A FAMILY SCRAPBOOK OF THE UNIVERSE

Hubble Deep Field: The first portrait of distant galaxies from the early universe. Hubble Space Telescope. Credit: Robert Williams and the Hubble Deep Field Team (STScI) and NASA.

IN THIS GUIDE

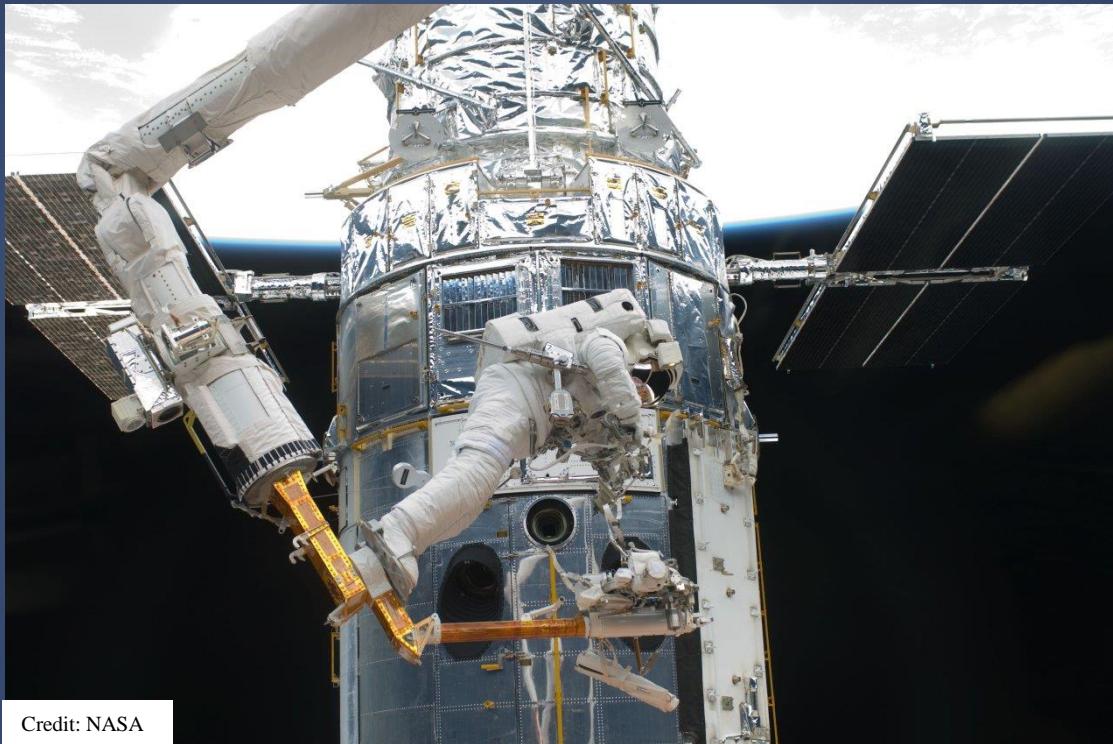
- » A SCRAPBOOK OF THE SOLAR SYSTEM, GALAXY, UNIVERSE
- » SKY FEATURE: HUBBLE DEEP FIELD
- » TRY THIS!

Universe Discovery Guides

http://nightsky.jpl.nasa.gov/news-display.cfm?News_ID=611



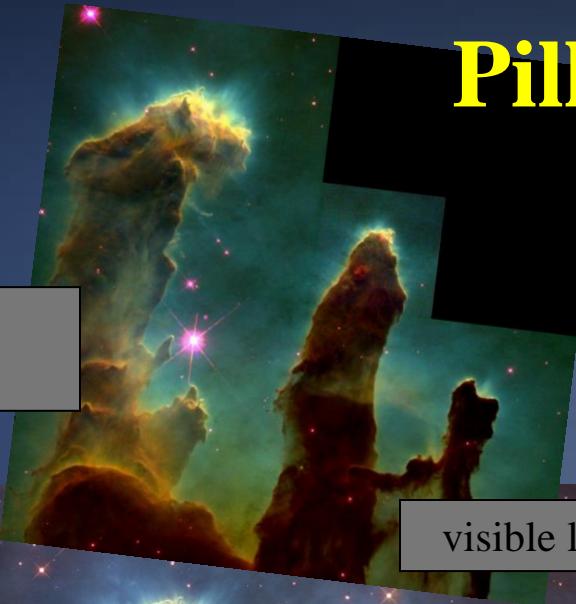
Supplementary Slides: Longevity of Hubble



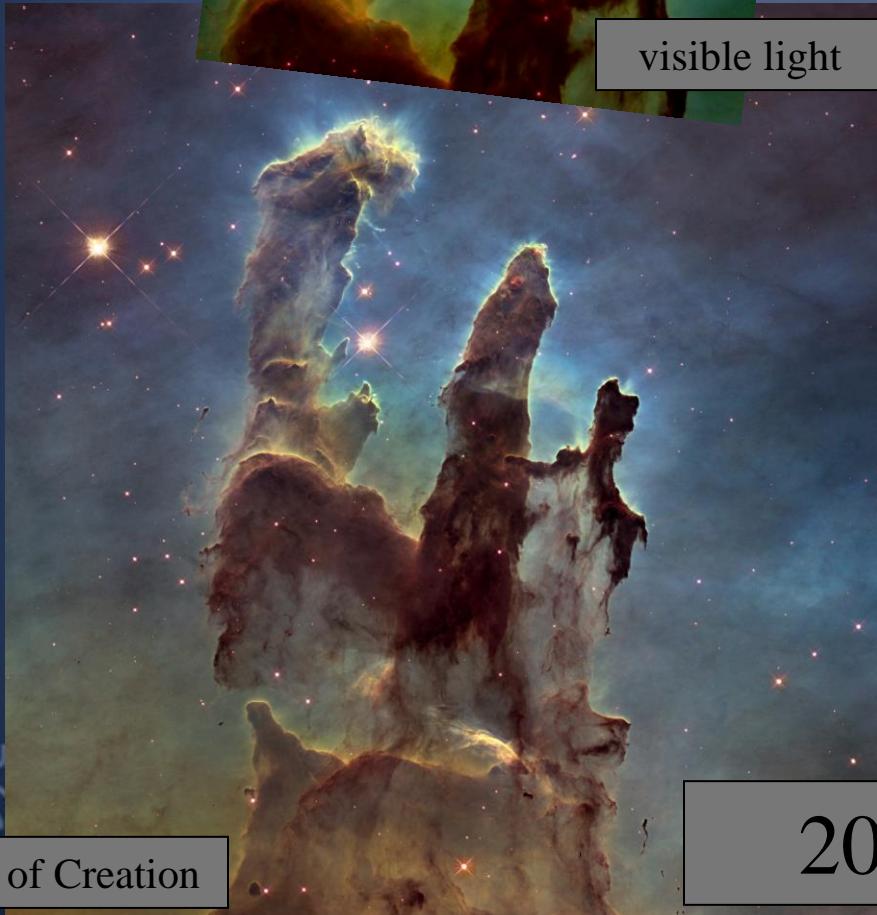
Credit: NASA

Since Hubble's launch in 1990, NASA has sent astronauts to service it five times. The servicing missions allow for the installation of new instruments that are more sensitive and can detect more types of light – thus enabling new groundbreaking science.

1995



visible light



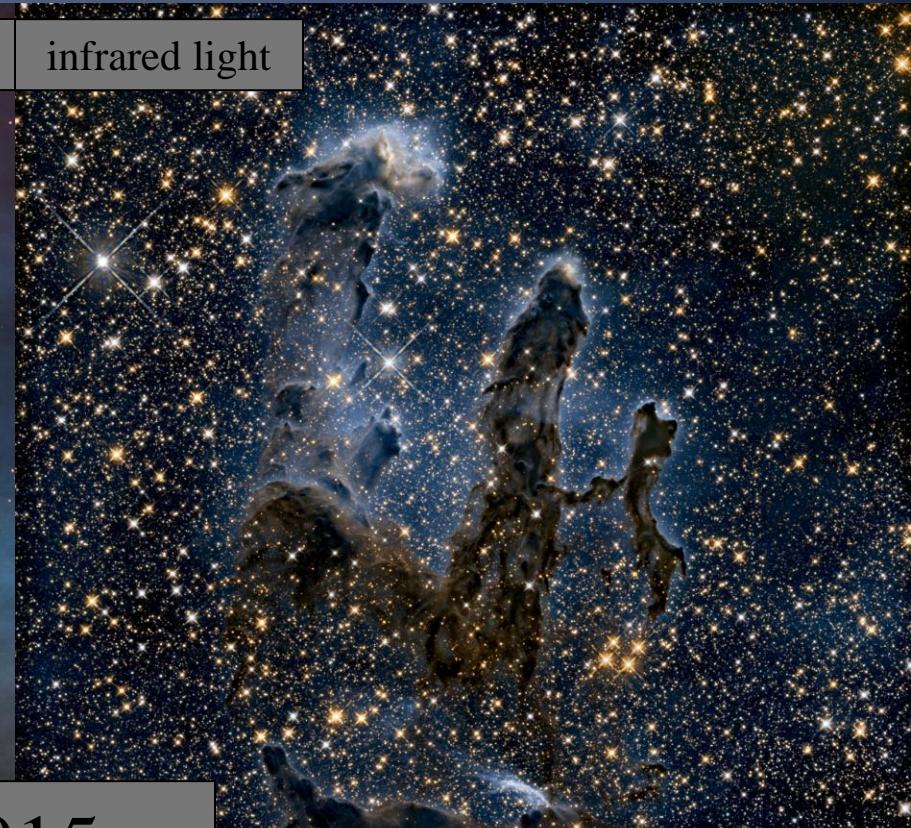
Pillars of Creation

Pillars of Creation Reborn

Hubble's images of star birth in gaseous and dusty nebulae stoke the public's imagination. The new ability to observe them in infrared light allows for us to peer inside these stellar nurseries.

1995: NASA, ESA, STScI, and J. Hester and P. Scowen (Arizona State University)
2015: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)

infrared light



2015

Islands of Stars



Andromeda Galaxy

Galaxies are comprised of normal matter, primarily in the form of stars, gas, and dust. In this mosaic, Hubble's largest to date, about a quarter of our nearby Andromeda Galaxy is visible in stunning detail.

2015

visible light



Nature's Fireworks



Westerlund 2

This young star cluster contains some of our galaxy's hottest, brightest, and most massive stars. We are getting a glimpse of how young stars affect their surrounds. The largest stars are unleashing a torrent of ultraviolet light and hurricane force winds that etch away the enveloping hydrogen gas cloud.

NASA, ESA, the Hubble Heritage Team (STScI/AURA), A. Nota (ESA/STScI), and the Westerlund 2 Science Team

2015

visible light
&
infrared light

